

Guest editorial: Renewable and hydrogen energy technologies

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Being able to foresee what might happen in the future, and to act in ways that support positive lines of development and discourages negative ones, are manifestations of some of the most advanced uses of human intelligence. The need for a radical energy transition is currently facing human societies, with a wealth of underlying causes: environmental impacts, climate change, resource depletion and nuclear proliferation. Will we be able to act in time and pave the road for a smooth transition (like we have done at least one time earlier in phasing out ozone emissions), or will the repercussion come upon us with insufficient preparations and result in widespread suffering?

As so many times before, the issue is not lack of knowledge, but rather lack of political courage to act to prevent the catastrophe, rather than act half-heartedly with insufficient measures, or only act to try to remedy the impacts, once they occur. The present special issue of IJER details some of the technical solutions and ways of assessing their consistency and resilience in supplying future energy needs. From a purely economic view, one may discuss whether the cost of prevention is lower than the cost of remedies after the negative impacts have occurred. However, modern economic thinking includes “externalities”, i.e. all the impacts on society that are not included in and sometimes cannot be included in a monetary analysis. In the latter category is much of the human suffering that global warming will cause in some parts of the world. In a full assessment including externalities, the advantage of actions sufficiently strong to avoid the problems mentioned, over the reactive policy approach, has been established beyond the margins of uncertainty.

Several of the papers in this special issue present visions of future energy systems by use of the scenario technique. Scenarios are not prediction but snapshot pictures of possible futures, constructed from normative visions and analysed for consistency. They will usually not happen by themselves but require action by decision-makers. The scenario method is the current scientific approach replacing the earlier use of forecasting techniques. Forecasting assumed that a “most likely” future development existed and only had to be identified. This method was first used by the Delphi oracles in ancient Greece and later by mainstream economists. That it does not work is a proof of human “free will” and implies that political decision-makers perform a very valuable job and make choices of real importance for their societies, rather than just administer the path laid out by some god.

The issue starts with articles describing key components of a future energy system based on sustainable sources and technologies. In particular the possible role of hydrogen as an energy carrier is a subject of careful assessment, looking at fuel cell conversion (Barbir and Yazici), hydrogen production (Blake *et al.*), hydrogen storage in connection with intermittent renewable sources (Leighty), and automotive applications (Tsuchiya). Finally, the construction of demand and supply scenarios is discussed and followed by a concrete example of simulating the functionality of a particular set of scenarios for a specific geographical region (Sørensen). Enjoy!